

I love teaching. I love helping students understand material that they found difficult and see the beautiful symmetry and connections in modern math. One of the biggest challenges in the subject is engaging students and finding ways to communicate subtle concepts to an audience with diverse backgrounds, cultures, and interests. My main strategies are to have dynamic lectures and to provide effective and timely self-guided feedback to students.

My thoughts about ways to interact with students in the classroom changed drastically last semester when the arrangement of the classroom provided for my Abstract Algebra class precluded traditional board work. Rather than write on the board, I wrote directly on a tablet PC, projecting the image onto the wall behind me. This relatively simple change in classroom procedure radically altered the dynamic in the classroom: I could face the students for the entire class, creating a more conversational atmosphere. The students felt more comfortable stopping me at any point, and I could quickly see confusion or comprehension. Moreover, the resulting transcript evolved in real-time, reflecting student questions and comments, and I could then post online exactly what appeared in class. I was elated to discover that students would then download copies of the notes, annotate them, and use these as tools to supplement their own notes when coming to ask questions.

This semester, the more traditional arrangement of the rooms for my two calculus classes prevents this kind of live-blogged communal discussions. However, my experience with my algebra class continues to inform my teaching. Rather than simply lecturing at the board, I present brief bits of material, interspersing them with questions either for the students to walk me through at the board or for them to work out at their seats in small groups. I continue to post notes from each lecture online after each class. This gives students an opportunity to catch up if they miss class or to check any points in their notes which might have been hard to see or hear in the classroom.

My second goal is to help students best assess what they have learned from lecture. For the past two semesters, I have assigned computational homework through WeBWorK, a great tool. Students appreciate instant feedback on problems, and it helps them better grasp exactly what they did not understand from previous lectures. This allows for more productive office hours: students bring focused questions, either related to a particular WeBWorK problem or of a more conceptual nature informed by their WeBWorK experience.

Building on this success, Christian Gromoll and I are running an experiment in online exams, funded by a grant from UVA. Almost all of a student's final grade is determined by performance on self-scheduled, repeatable exams administered through MapleTA. The exams themselves become a non-punative learning tool. Students learn what they do not know immediately from the exam, and they have the opportunity and motivation (in the form of a higher grade) to learn it. The online, repeatable nature of the exams also affords students the chance to demonstrate their mastery of the material in a lower stress environment, and the tests themselves can readily be adapted to accommodate special needs.

As technology evolves, there are more opportunities to extend teaching beyond the classroom. I already find that students share my online notes with friends at UVA and at other schools. As one student told me, her brother, a student at another university, "said those notes were a life-saver when he was studying for that final!" My next goal is to incorporate into my classes audio and video podcasts, using MIT's OpenCourseWare and iTunes U as a model for a marriage between technology and teaching. For lower level classes like Calculus, having recordings of lectures available for download serves as a valuable study aid and can help ESL and special-needs students better follow the class by listening at their own pace. For more advanced classes, this would allow students in locations without a local specialist in a particular field still to learn the material from an expert.